We claim:

1. A coating composition adapted to enhance the adhesion of a coating to a substrate comprising:

a) at least one coupling agent, at least partial hydrolysates thereof or mixtures thereof, in a concentration greater than 25 weight percent based on the weight of the total composition; and

b) an adhesion enhancing amount of an epoxy-containing material comprising at least two epoxy groups; said coating composition being free of colloidal particles chosen from silica, alumina or a mixture thereof.

2. The coating composition of claim 1 wherein the at least one coupling agent is an silane coupling agent represented by the following formula, at least partial hydrolysates thereof or mixtures thereof:

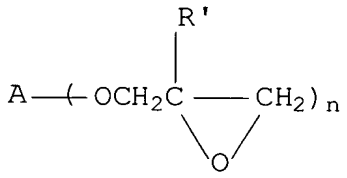
$$(R_1)_a(R_2)_b\ Si(OR_3)_c$$

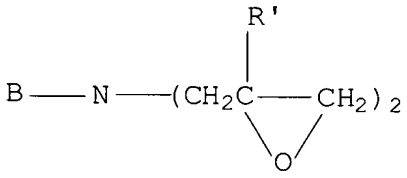
wherein each R_1 is an organofunctional group independently chosen for each occurrence from glycidoxy, amino, vinyl, styrl, (meth)acryloyloxy, mercapto or a hydrocarbon radical having less than 10 carbon atoms substituted with said organofunctional group; each R_2 is a hydrocarbon radical having less than 20 carbon atoms independently chosen for each occurrence from aliphatic radicals, aromatic radicals or mixtures of such hydrocarbon radicals; each R_3 is a radical having less than 20 carbon atoms independently chosen for each occurrence from monovalent aliphatic hydrocarbon radicals, aromatic hydrocarbon radicals, alkoxyalkyl radicals, acyl radicals or mixtures of such radicals; a is 1 or 2, b is 0, 1 or 2 and c is 1, 2 or 3 provided that the sum of a+b+c equals 4.

3. The coating composition of claim 2 wherein each R_1 is an organofunctional group chosen from mercapto, glycidoxy, (meth)acryloyloxy, or a hydrocarbon radical chosen from C_1-C_6 alkyl or phenyl substituted with said

organofunctional group; each R_3 is C_1-C_6 alkyl, phenyl, acetyl or benzoyl; a is 1, b is 0 and c is 3.

4. The coating composition of claim 1 wherein the epoxy-containing material comprising at least 2 epoxy groups is chosen from materials represented by the following graphic formulae I, II or a mixture thereof;

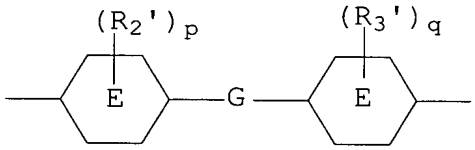
I 

II 

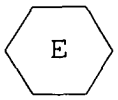
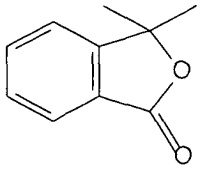
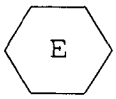
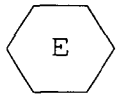
wherein

(i) R' is hydrogen or C_1-C_3 alkyl;

(ii) n is an integer chosen from 2, 3 or 4; A is chosen from C_2-C_{20} alkylene, substituted C_2-C_{20} alkylene, C_3-C_{20} cycloalkylene, substituted C_3-C_{20} cycloalkylene; the unsubstituted or substituted arylene groups, phenylene and naphthylene; aryl(C_1-C_3)alkylene, substituted aryl(C_1-C_3)alkylene; the group -C(O)Z(O)C- wherein Z is C_2-C_{20} alkylene or arylene; the group -R-$(OR)_m$- or -$(OR)_m$-, wherein R is C_2-C_4 alkylene and m is an integer from 1 to 20; phthaloyl, isophthathoyl, terephthaloyl; hydroxyl-substituted phthaloyl, hydroxy-substituted isophthaloyl, hydroxy-substituted terephthaloyl; or a group represented by the following graphic formula:



wherein R_2' and R_3' are each independently for each occasion chosen from C_1-C_4 alkyl, chlorine or bromine; p and q are each

an integer from 0 to 4;  represents a divalent benzene group or a divalent cyclohexane group; G is -O-, -S-, -S(O_2)-, -C(O)-, -CH_2-, -CH=CH-, -C(CH_3)$_2$-, -C(CH_3)(C_6H_5)-, -(C_6H_4)- or  when  is the divalent benzene group; or G is -O-, -S-, -CH_2-, or -C(CH_3)$_2$-, when  is the divalent cyclohexane group; said alkylene and cycloalkylene substituents being carboxy, hydroxy or C_1-C_3 alkoxy; said arylene and aryl(C_1-C_3)alkylene substituents being carboxy, hydroxy, C_1-C_3 alkoxy or C_1-C_3 alkyl; and

(iii) B is chosen from C_2-C_{20} alkyl, substituted C_2-C_{20} alkyl, C_3-C_{20} cycloalkyl, substituted C_3-C_{20} cycloalkyl; the unsubstituted or substituted aryl groups, phenyl and naphthyl; aryl(C_1-C_3)alkyl or substituted aryl(C_1-C_3)alkyl; said alkyl and cycloalkyl substituents being carboxy, hydroxy or C_1-C_3 alkoxy, said aryl and aryl(C_1-C_3)alkyl substituents being carboxy, hydroxy, C_1-C_3 alkoxy or C_1-C_3 alkyl.

5. The coating composition of claim 4 wherein: R' is hydrogen; A is chosen from C_2-C_{10} alkylene, phenylene, -R-$(OR)_m$- or -$(OR)_m$-, wherein R and m are the same as defined hereinbefore; or phthaloyl; B is chosen from C_2-C_{10} alkyl, phenyl or phenyl(C_1-C_3)alkyl.

6. The coating composition of claim 1 wherein the epoxy-containing material comprising at least 2 epoxy groups is chosen from: glycerol polyglycidyl ether; diglycerol polyglycidyl ether; glycerol propoxylate triglycidyl ether; trimethylolpropane triglycidyl ether; sorbitol polyglycidyl ether; poly(ethylene glycol)diglycidyl ether; poly(propylene

glycol)diglycidyl ether; neopentyl glycol diglycidyl ether; N,N-diglycidyl-4-glycidyloxyaniline; N,N'-diglycidyltoluidine; 1,6-hexane diol diglycidyl ether; diglycidyl 1,2-cyclohexanedicarboxylate; diglycidyl bisphenol A; a polymer of diglycidyl bisphenol A; poly(bisphenol A-co-epichlorohydrin), glycidyl endcapped; diglycidyl of a hydrogenated bisphenol A propylene oxide adduct; diglycidyl ester of terephthalic acid; diglycidyl 1,2,3,6-tetrahydrophthalate; spiroglycoldiglycidyl ether; hydroquinone diglycidyl ether or mixtures thereof.

7. The coating composition of claim 1 further comprising a catalyst chosen from an acidic material, a material, different from the acidic material, adapted to generate acid upon exposure to actinic radiation or a mixture thereof.

8. The coating composition of claim 7 wherein the catalyst is an acidic material and is chosen from an organic acid, inorganic acid or mixture thereof.

9. The coating composition of claim 8 wherein the catalyst is an acidic material and is chosen from acetic, formic, glutaric, maleic, nitric, hydrochloric, phosphoric, hydrofluoric, or sulfuric acid.

10. The coating composition of claim 7 wherein the catalyst is a material adapted to generate acid upon exposure to actinic radiation and is chosen from onium salts, iodosyl salts, aromatic diazonium salts, metallocenium salts, sulphonate esters of aromatic alcohols containing a carbonyl group in a position alpha or beta to the sulphonate ester group, N-sulphonyloxy derivatives of an aromatic amide or imide, aromatic oxime sulphonates, quintone diazides or mixtures thereof.

11. The coating composition of claim 10 wherein the catalyst is a material adapted to generate acid upon exposure to actinic radiation and is chosen from diaryliodonium salts, triarylsulfonium salts or mixtures thereof.

12. The coating composition of claim 1 further comprising at least one material comprising at least one (meth)acrylic group and at least one carboxylic group.

13. The coating composition of claim 12 wherein the material comprising at least one (meth)acrylic group and at least one carboxylic group is represented by the following formula:

$$CH_2{=}{=}C(R_4)C(O)OR_5OC(O)CR_6R_7CR_8R_9(CR_{10}R_{11})_d{-}{-}COOH$$

wherein R_4 is hydrogen or methyl, R_5 is a substituted or unsubstituted alkylene group having from 2 to 6 carbon atoms, and R_6, R_7, R_8, R_9, R_{10} and R_{11} are independently chosen for each occasion from hydrogen, straight or branched chain, saturated or unsaturated aliphatic, cycloaliphatic or polycycloaliphatic groups having from 1 to 20 carbon atoms and d is chosen from 0 or 1.

14. The coating composition of claim 12 wherein the material comprising at least one (meth)acrylic group and at least one carboxylic group is chosen from mono-2-(acryloyloxy)ethyl succinate, mono-2-(methacryloyloxy)ethyl phthalate, mono-2-(methacryloyloxy)ethyl maleate, mono-2-(methacryloyloxy)ethyl succinate or mixtures thereof.

15. The coating composition of claim 1 further comprising:

a) a material represented by:

$$(R_{12})_eMX_{(4-e)}$$

hydrolysates of said material or a mixture thereof; wherein M is chosen from silicon, titanium or zirconium, X is independently chosen for each occasion from halogen, alkoxy groups of from 1 to 12 carbon atoms or acyloxy groups of from 1 to 12 carbon atoms, R_{12} is independently chosen for each occasion from alkoxy groups of from 1 to 12 carbon atoms, aliphatic hydrocarbon groups of from 1 to 12 carbon atoms, or acyloxy groups of from 1 to 12 carbon atoms, and e is the integer 1, 2, or 3.

16. The coating composition of claim 15 wherein M is chosen from silicon, X is independently chosen for each

occasion from alkoxy groups of from 1 to 6 carbon atoms or acyloxy groups of from 1 to 6 carbon atoms; R_{12} is independently chosen for each occasion from alkoxy groups of from 1 to 6 carbon atoms or aliphatic hydrocarbon groups of from 1 to 6 carbon atoms; and e is the integer 1 or 2.

17. The coating composition of claim 15 wherein the material is chosen from methyltrimethoxysilane, methyltriethoxysilane, methyltriacetoxysilane, methyltripropoxysilane, methyltributoxysilane, ethyltrimethoxysilane, ethyltriethoxysilane, dimethyldiethoxysilane, tetramethoxysilane, tetraethoxysilane, tetra-n-propoxysilane, tetra-n-butoxysilane, tetra(C_1-C_{18}) alkoxy titanates, methyltriethoxy titanium (iv), tetra(C_1-C_{18}) alkoxy zirconates, phenylzirconium (iv) trichloride, hydrolysates thereof, or mixtures thereof.

18. The coating composition of claim 10 further comprising at least one photosensitive dye.

19. A process for producing a substantially adherent polymeric coating on a substrate comprising:

(a) obtaining a substrate;

(b) applying to said substrate (a) an at least partial coating of a coating composition adapted to enhance the adhesion of a coating to a substrate comprising:

i) a material chosen from silane coupling agents, titanate coupling agents, zirconate coupling agents, at least partial hydrolysates thereof or mixtures thereof in a concentration greater than 25 weight percent based on the total weight of the total composition; and

ii) an adhesion enhancing amount of an epoxy-containing material comprising at least 2 epoxy groups; said coating composition being free of colloidal particles chosen from silica, alumina or a mixture thereof;

(c) applying to the adhesion enhancing coating an at least partial coating of a polymeric coating composition, different from the adhesion enhancing coating; and

(d) at least partially curing the coated substrate.

20. The process of claim 19 further comprising at least partially curing the adhesion enhancing coating before applying an at least partial coating of a polymeric coating composition.

21. The process of claim 19 further comprising pretreating the substrate to produce surface reactive groups by:

(a) cleaning said substrate;

(b) exposing said substrate to strong alkali, activated gas, ionizing radiation or a combination thereof;

(c) at least partially applying a primer composition adapted to receive a subsequently applied coating to said substrate; or

(d) a combination thereof.

22. The process of claim 19 wherein the coating composition adapted to enhance the adhesion of a coating to a substrate further comprises a catalyst chosen from an acidic material, a material adapted to generate acid upon exposure to actinic radiation or a mixture thereof.

23. The process of claim 22 wherein the coating composition adapted to enhance the adhesion of a coating to a substrate further comprises at least one material chosen from:

(a) a material comprising at least one (meth)acrylic group and at least one carboxylic group;

(b) a material represented by:

$$(R_{12})_bMX_{(4-b)}$$

hydrolysates of said material or a mixture thereof; wherein M is chosen from silicon, titanium or zirconium, X is independently chosen for each occasion from halogen, amino, alkoxy groups of from 1 to 12 carbon atoms or acyloxy groups of from 1 to 12 carbon atoms, R_{12} is independently chosen for each occasion from alkoxy groups of from 1 to 12 carbon atoms, hydrocarbon groups of from 1 to 12 carbon atoms, or

acyloxy groups of from 1 to 12 carbon atoms, and b is the integer 1, 2, or 3;

(c) photosensitive dye; or

(d) a mixture thereof.

24. The process of claim 19 wherein the at least partial curing of the coated substrate is done by exposure to actinic radiation, thermally or a combination thereof.

25. The process of claim 19 wherein the polymeric coating composition is chosen from a thermoplastic or thermosetting coating composition.

26. The process of claim 25 wherein the polymeric coating composition is a thermosetting coating composition chosen from polyurethanes, aminoplast resins, poly(meth)acrylates, polyanhydrides, polyacrylamides, epoxy resins or polysilanes.

27. The process of claim 19 wherein the polymeric coating composition further comprises a photochromic amount of photochromic material.

28. The process of claim 27 wherein the photochromic material is an organic photochromic material, inorganic photochromic material or a mixture thereof.

29. The process of claim 28 wherein the photochromic material is an organic photochromic material and is chosen from naphthopyrans, benzopyrans, phenanthropyrans, indenonaphthopyrans, oxazines, metal-dithiozonates, fulgides, fulgimides, spiro(indoline)pyrans or mixtures thereof.

30. The process of claim 28 wherein the photochromic material is an inorganic photochromic material and is chosen from silver halide, cadmium halide, copper halide europium (II), cerium(III) or mixtures thereof.

31. The process of claim 19 wherein the polymeric coating composition further comprises a material chosen from silane coupling agents, titanate coupling agents, zirconate coupling agents, at least partial hydrolysates thereof or mixtures thereof.

32. The process of claim 19 further comprising applying an at least partially abrasion resistant protective coating to the at least partially cured coated substrate.

33. The process of claim 32 further comprising applying an at least partially antireflective coating to the at least partially abrasion resistant coating.

34. The process of claim 19 further comprising applying to the at least partially cured coated substrate an at least partial coating of a (meth)acrylate based radiation curable coating composition.

35. The process of claim 34 further comprising applying an at least partially abrasion resistant protective coating to the at least partial coating of an (meth)acrylate based radiation curable coating composition.

36. A process for producing a substantially adherent polymeric film on a substrate comprising:

(a) obtaining a substrate;

(b) applying to said substrate (a) an at least partial coating of a coating composition adapted to enhance the adhesion of a film to a substrate comprising:

i) a material chosen from silane coupling agents, titanate coupling agents, zirconate coupling agents, at least partial hydrolysates thereof or mixtures thereof, in a concentration greater than 25 weight percent based on the total weight of the total composition; and

ii) an adhesion enhancing amount of an epoxy-containing material comprising at least 2 epoxy groups; said coating composition being free of colloidal particles chosen from silica, alumina or a mixture thereof;

(c) applying an at least partial covering of a photochromic polymeric film to the adhesion enhancing coating; and

(d) at least partially curing the adhesion enhancing coating.

37. The process of claim 36 wherein the photochromic polymeric film is a laminant comprising at least 2 films, said laminant having an outer film and an inner

film, said outer film being an at least partially abrasion resistant film and said inner film being a photochromic polymeric film appended to the adhesion enhancing coating.

38. The process of claim 37 wherein the at least partially abrasion resistant film being a thermoplastic polycarbonate and the photochromic polymeric film being a photochromic thermoplastic polyurethane film.

39. A coated article comprising:

(a) a substrate;

(b) an at least partially cured adhesion enhancing coating of ingredients comprising:

(i) a material chosen from silane coupling agents, titanate coupling agents, zirconate coupling agents, at least partial hydrolysates thereof or mixtures thereof,

in a concentration greater than 25 weight percent based on the total weight of the total composition; and

ii) an adhesion enhancing amount of a epoxy-containing material comprising at least 2 epoxy groups; said coating composition being free of colloidal particles chosen from silica, alumina or a mixture thereof; and

(c) an at least partially cured polymeric coating.

40. The coated article of claim 39 further comprising an at least partial coating of primer interposed between the at least partially cured adhesion enhancing coating and the substrate.

41. The coated article of claim 39 further comprising an at least partial coating of an at least partially abrasion resistant coating applied to the surface of the at least partially cured polymeric coating.

42. The coated article of claim 41 further comprising an at least partial coating of an at least partially antireflective coating applied to the at least partial coating of an at least partially abrasion resistant coating applied to the surface of the at least partially cured polymeric coating.

43. The coated article of claim 39 wherein the substrate is chosen from paper, glass, ceramic, wood, masonry, textile, metal or organic polymeric material.

44. The coated article of claim 43 wherein the substrate is organic polymeric material and said organic polymeric material is chosen from poly(C_1-C_{12} alkyl methacrylates), poly(oxyalkylene dimethacrylates), poly(alkoxylated phenol methacrylates), cellulose acetate, cellulose triacetate, cellulose acetate propionate, cellulose acetate butyrate, poly(vinyl acetate), poly(vinyl alcohol), poly(vinyl chloride), poly(vinylidene chloride), thermoplastic polycarbonates, polyesters, polyurethanes, poly(ethylene terephthalate), polystyrene, poly(alpha methylstyrene), copoly(styrene-methylmethacrylate), copoly(styrene-acrylonitrile), polyvinylbutyral or is polymerized from monomers chosen from bis(allyl carbonate) monomers, polyfunctional acrylate monomers, polyfunctional methacrylate monomers, diethylene glycol dimethacrylate monomers, diisopropenyl benzene monomers, ethoxylated bisphenol A dimethacrylate monomers, ethylene glycol bismethacrylate monomers, poly(ethylene glycol) bismethacrylate monomers, ethoxylated phenol bis methacrylate monomers, alkoxylated polyhydric alcohol polyacrylate monomers, styrene monomers, urethane acrylate monomers, glycidyl acrylate monomers, glycidyl methacrylate monomers, diallylidene pentaerythritol monomers or mixtures thereof.

45. The coated article of claim 43 wherein the substrate is an organic polymeric material and said organic polymeric material is an optical element.

46. The coated article of claim 45 wherein the substrate is an optical element and said optical element is an ophthalmic lens.

47. The coated article of claim 39 wherein the adhesion enhancing coating further comprises ingredients chosen from:

(a) a catalyst chosen from an acidic material, a material adapted to generate acid upon exposure to actinic radiation or a mixture thereof;

(b) a material comprising at least one (meth)acrylic group and at least one carboxylic group;

(c) a material represented by:

$$(R_{12})_bMX_{(4-b)}$$

hydrolysates of said material or a mixture thereof; wherein M is chosen from silicon, titanium or zirconium, X is independently chosen for each occasion from halogen, amino, alkoxy groups of from 1 to 12 carbon atoms or acyloxy groups of from 1 to 12 carbon atoms, R_{12} is independently chosen for each occasion from alkoxy groups of from 1 to 12 carbon atoms, hydrocarbon groups of from 1 to 12 carbon atoms, or acyloxy groups of from 1 to 12 carbon atoms, and b is the integer 1, 2, or 3;

(d) photosensitive dye; or

(e) a mixture thereof.

48. A laminated article comprising:

(a) a substrate;

(b) an at least partially cured adhesion enhancing coating of ingredients comprising:

(i) a material chosen from silane coupling agents, titanate coupling agents, zirconate coupling agents, at least partial hydrolysates thereof or mixtures thereof, in a concentration greater than 25 weight percent based on the total weight of the total composition; and

ii) an adhesion enhancing amount of a epoxy-containing material comprising at least 2 epoxy groups; said coating composition being free of colloidal particles chosen from silica, alumina or a mixture thereof; and

(c) an at least partial covering of a photochromic polymeric film appended to said at least partially cured adhesion enhancing coating.

49. The laminated article of claim 48 wherein the photochromic polymeric film comprises a laminant of a photochromic thermoplastic polyurethane film and an at least

partially abrasion resistant thermoplastic polycarbonate film, said photochromic thermoplastic polyurethane film side of said laminant being appended to the at least partially cured adhesion enhancing coating.

50. The laminated article of claim 48 wherein the adhesion enhancing coating further comprises ingredients chosen from:

(a) a catalyst chosen from an acidic material, a material, different from the acidic material, adapted to generate acid upon exposure to actinic radiation or a mixture thereof;

(b) a material comprising at least one (meth)acrylic group and at least one carboxylic group;

(c) a material represented by:

$$(R_{12})_bMX_{(4-b)}$$

hydrolysates of said material or a mixture thereof; wherein M is chosen from silicon, titanium or zirconium, X is independently chosen for each occasion from halogen, amino, alkoxy groups of from 1 to 12 carbon atoms or acyloxy groups of from 1 to 12 carbon atoms, R_{12} is independently chosen for each occasion from alkoxy groups of from 1 to 12 carbon atoms, hydrocarbon groups of from 1 to 12 carbon atoms, or acyloxy groups of from 1 to 12 carbon atoms, and b is the integer 1, 2, or 3;

(d) photosensitive dye; or

(e) a mixture thereof.